AD-A103 068 NAVAL UNDERWATER SYSTEMS CENTER NEWPORT RI F/G 14/3
SHIPBOARD DATA RECORDING INSTRUMENTATION; DESCRIPTION AND FUNCT--ETC(U)
APR 79
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26 April 1979

LEVEL II

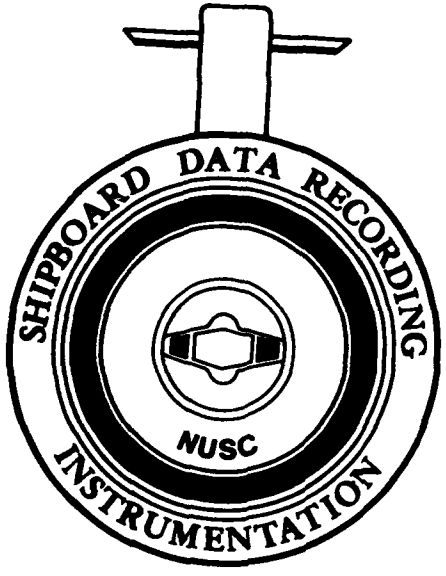
Shipboard Data Recording Instrumentation: Description and Functions.

Weapon Systems Department

(9) Technical document.

(12) 27

(14) NUSC-TD-5660



Naval Underwater Systems Center
Newport Laboratory

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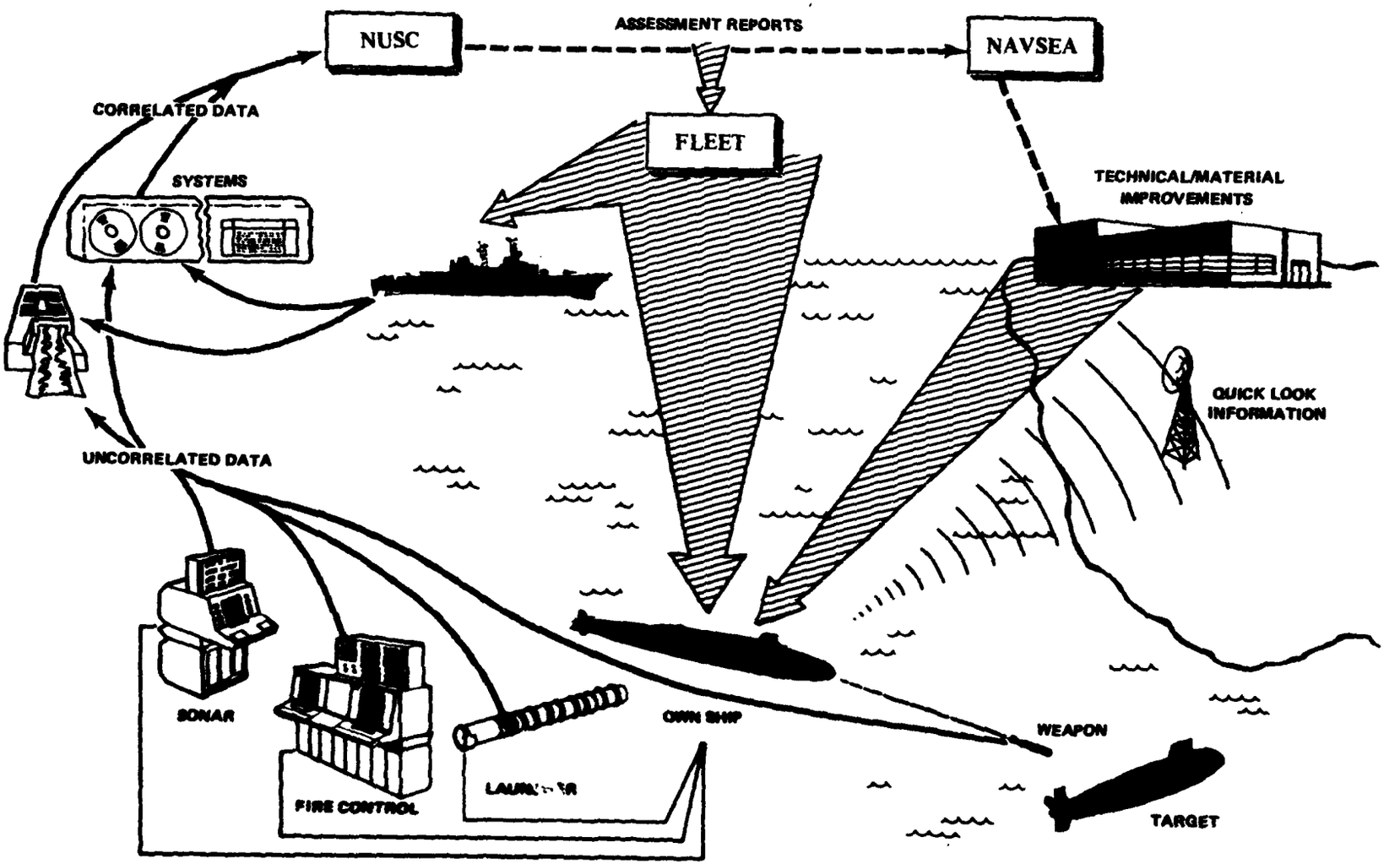
SDRI


NUSC
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UNCORRELATED DATA
SONAR
FIRE CONTROL
OWN SHIP
WEAPON
TARGET

WHAT SDRI IS

The Shipboard Data Recording Instrumentation (SDRI) Systems are digital and analog recording systems used for real-time recording of pre- and post-launch data during weapon firing exercises.

The DGS, MDGS, DGU, MDGU, CIU, DTRS, and TTIS are transportable systems which are loaded aboard the firing ship for specific periods of operating time. The DGM software module is integral to its shipboard system.

NUSC-trained personnel install and operate the SDRI systems.

Management of the transportable SDRI systems is controlled by:

Commanding Officer
Naval Underwater Systems Center
Newport, Rhode Island 02840
Attention: Code 362

WHO USES IT

The SDRI systems are used to support weapon system programs by providing data to:

1. System commands,
2. Type commands,
3. Development groups,
4. Laboratories, and
5. Contractors.

WHEN IT IS USED

SDRI systems are used:

1. During Torpedo Mk 48 TCP, PRO, PCO, Test and Evaluation, and special testing;
2. During WSAT, CCST, CCT, TECHEVAL, and Certification (Torpedo Mk 48, SUBROC, and HARPOON); and
3. During maintenance and calibration (MRC and FORACS).

WHY IT IS USED

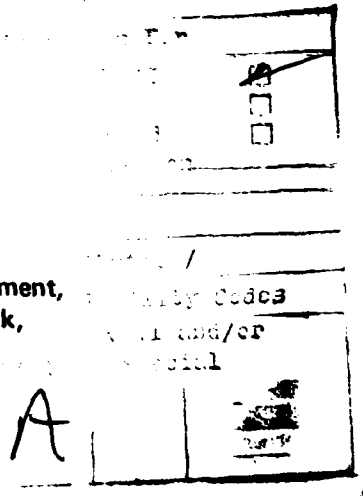
The SDRI systems provide a highly accurate time-correlated record of shipboard data for subsequent detailed analysis using shore-based facilities. The use of SDRI minimizes constraints placed on operational exercises by conventional manual data-recording techniques.

Recorded SDRI data are also used for:

1. Real-time display,
2. Systems calibration,
3. Systems checks, and
4. Time-of-fire data verification.

Processed SDRI data are used for:

1. Quick look information
2. Data analysis,
3. Material and tactical improvements,
4. ASW weapon system performance assessment,
5. Permanent entry in the weapon data bank,
6. Trend definition, and
7. Special studies.



THE SDRI SYSTEMS

DGS Data Gathering System - First of the digital data-gathering systems, the DGS was designed for FCS Mk 113/6, 8, Mk 114/8, 11 and extended to FCS Mk 113/12, 14 and Mk 113/10 (SSN 686/687).

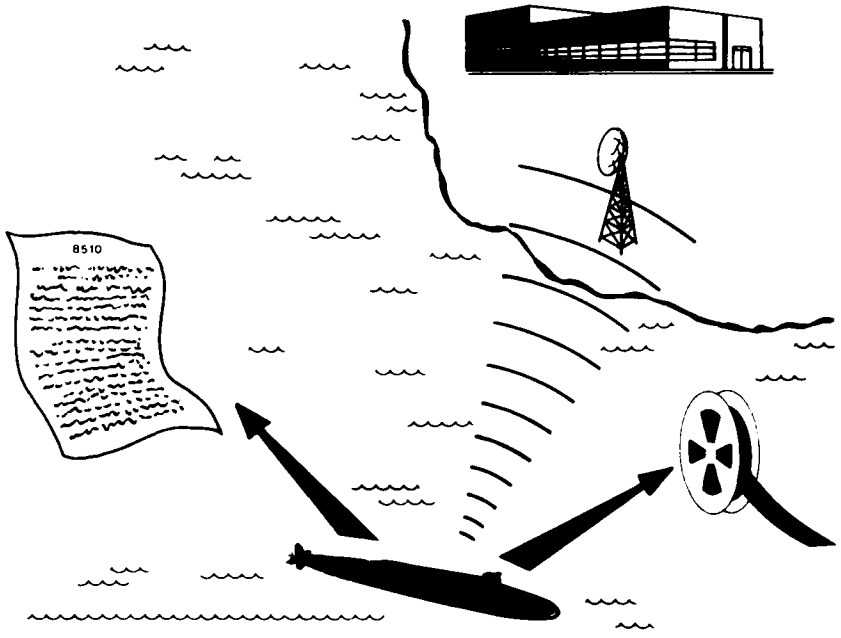
MDGS Modified Data Gathering System - MDGS extended capability to include the FCS Mk 112/2, 113/9, 113/10 (SSN 686/687) and 113/12, 14. Multiplexing reduced size and added switched Attack Director recording capability.

DGU Data Gathering Unit - Also digital, the DGU was developed for the FCS Mk 101 and FCS Mk 106 and later extended for FCS Mk 112/2 use.

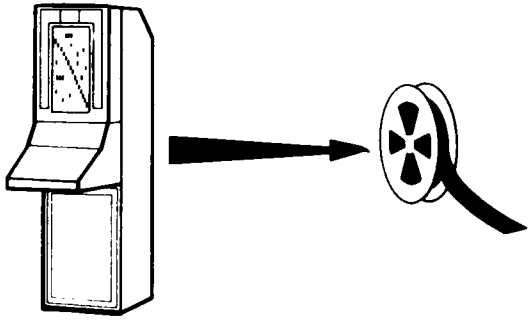
MDGU Modified Data Gathering Unit - The MDGU added FCS Mk113/6, 8, 12, 14 and Mk 113/10 (SSN 686/687) to DGU capability.

CIU Converter Interface Unit - This carry-on unit conditions FCS Mk 113/10 weapon-order subsystem data for shipboard computer recording.

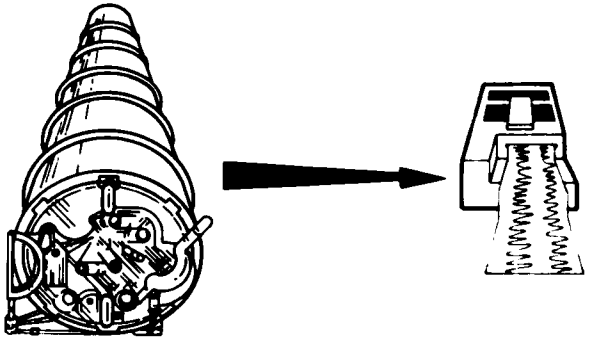
DGM Data Gathering Module - DGM is a resident FCS Mk 117 shipboard and weapon data recording system.



DTRS Digital Tape Recorder Subsystem - This carry-on mag tape unit records AN/BQR-24 Sonar System, FCS Mk 113/12, 14, and weapon system data.



TTIS Torpedo Tube Instrumentation System - TTIS is for launcher, guidance wire, and weapon transmissions.



SAFETY FEATURES

Electrical

Signal buffering: No electrical signal loading of the shipboard systems.

Isolation: Grounding to the ship at only one point. Inputs are transformer and optically isolated.

Fusing: Inputs are fused to protect both shipboard power sources and SDRI systems.

Operation: Training mode and spare circuits are used to minimize interference with tactical mode.

Installation: Parallel data access circuits added by SHIPALTs and ORDALTs prevent interference with normal operation.

Mechanical

Mounting: Restrained to prevent slippage aboard ship and is shock resistant.

Environmental

Packaging: Reusable, portable, weather-resistant containers.

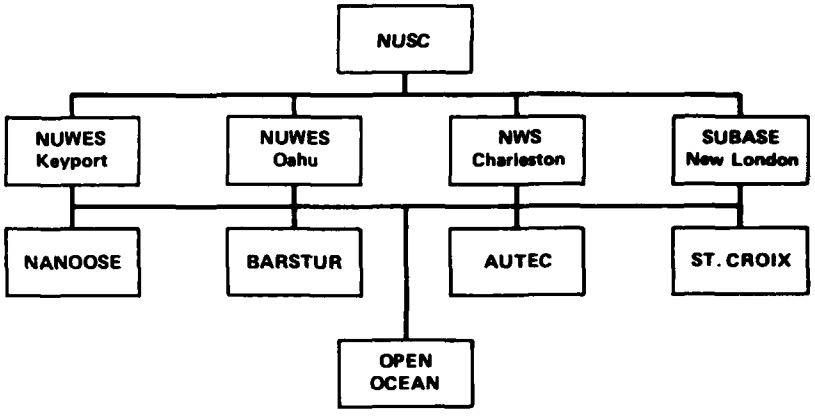
Loading and Handling

Certified shipboard safe.

LOGISTICS

Trained personnel and equipment are dispatched by NUSC, Newport, and four IMA sites, to support SUBLANT and SUBPAC Fleet firing operations at designated in-water ranges and in open-ocean operating areas.

NUSC, Newport administers all elements of logistics support.



SDRI/FCS SELECTION

The SDRI Systems evolved to accommodate both analog and digital fire control systems. Therefore, hardware, software, and operator configurations vary. Sonar and torpedo tube data recordi systems were developed independently.

Additional data are listed on the sheets describing the individual system types.

FCS		SDRI							
		FIRE CONTROL						SONAR	TORP. TUBE
MK	MOD	DGS	MDGS	DGU	MDGU	CIU	DGM	DTRS	TTIS
101	ALL			●	●				●
106	ALL			●	●				●
112	2		●	●	●				●
113	6, 8	●	●		●				●
113	9		●						●
113	10	(1)	(1)		(1)	(2)			(1)
113	12, 14	●	●		●			●	●
114	8, 11	(3)							(3)
117	ALL						●		●
118									●

(1) SSN 686, 687 (2) SSN 688 CLASS (3) UPON MODIFICATION OF INSTRUMENTATION

THE SYSTEMS

DATA GATHERING SYSTEM

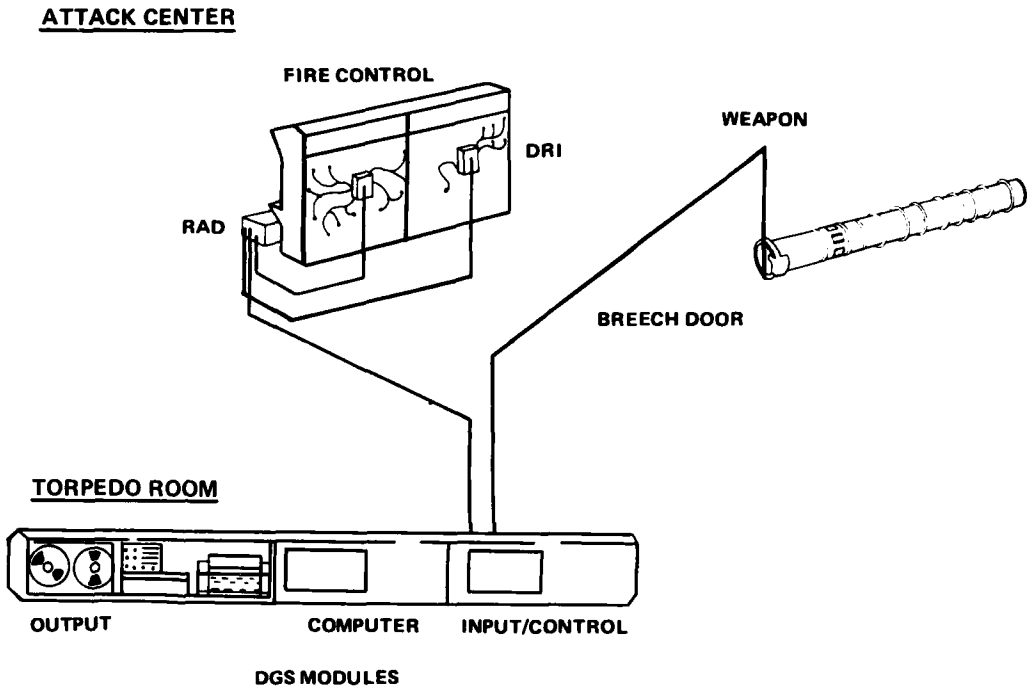
for Fire Control Systems

Mk 113/6, 8, 10 (SSN 686, 687)

Mk 113/12, 14 Mk 114/8, 11

. . . and Weapon Systems

Mk 37 Mk 48 SUBROC



DIMENSIONS (IN)

	w	h	d
COMPUTER MODULE	67	23	24
OUTPUT MODULE	67	23	24
INPUT/CONTROL MODULE	67	27	24
RAD	16	19	40

WEIGHTS (LB)

COMPUTER MODULE	380
OUTPUT MODULE	486
INPUT/CONTROL MODULE	380
RAD	220

POWER REQUIREMENTS

	Vac	Hz	∅	VA
TORPEDO ROOM	115	60	1	3735
TORPEDO ROOM	115	400	3	1200
ATTACK CENTER	115	400	3	750

SPECIFICATIONS

Timing: clock, microwave, or pulse.
Output: Mag tape, line printer, punch tape.
Capacity: 176 data channels, 96 discrete bits.
Recording Rates: 0.1-, 1.0- and 10.0-second intervals, or manual/external marks.

DATA ACCESS

Attack Center data are accessed by the T-connector, cable assemblies, and junction boxes of the DRI.

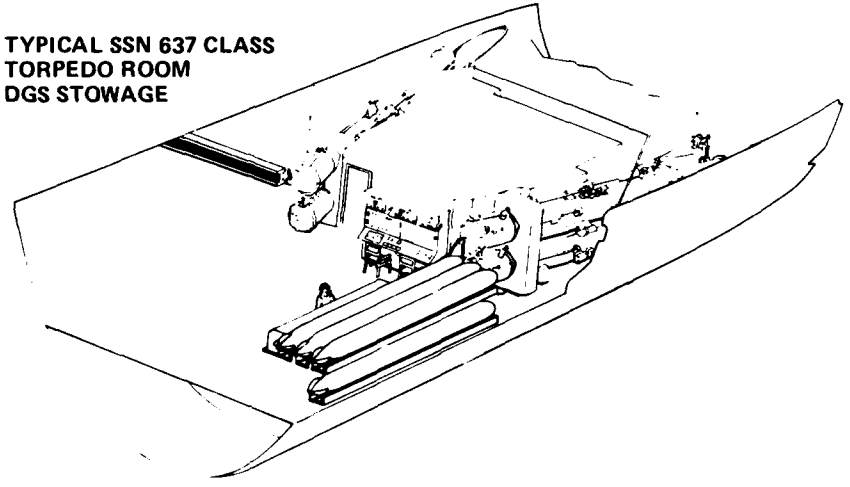
Weapon data are accessed through a T-connector and cable assembly connected together at the breech door.

SHIPBOARD DATA RECORDED

FCS MK	FCS MOD	SHIPBOARD SOURCE	DATA: OWN SHIP	BEARING/RANGE	TARGET MOTION ANAL.	WEAPON ORDER ANAL.	POSITION KEEPING	DEAD RECKONING	FIRING SEQUENCE	WIRE COMMANDS	WIRE CURRENT	PRESETS	WEAPON ORDER	WEAPON STATUS	TUBE STATUS
113	6, 8	ANALYZER MK 51		●	●										
		STABILIZATION CONTROL UNIT MK 83			●										
		ATTACK DIRECTOR MK 75	●	●	●	●	●	●			●		●		
	10[2]	TORPEDO CONTROL CONSOLE MK 66				●				●					
	12, 14	ATTACK CONTROL CONSOLE MK 50 [3]	●	●										●	●
		BREECH DOOR				●			●			●			
		FIRING CONSOLE MK 85 [2]												●	●
114[1]	8, 11														

(1) UPON MODIFICATION (2) SSN686, 687 (3) FCS MK 113/6, 8, 12, 14 ONLY

TYPICAL SSN 637 CLASS TORPEDO ROOM DGS STOWAGE



PREPARATION FOR LOADING

DGS is uncrated at dockside after rail, truck, or air shipment and loaded by crane. All handling gear is provided with DGS. Loading requires ship's force, topside supervisor, and tagline handlers. NUSC supplies trained personnel to supervise loading of equipment and conduct installation and operation.

DGS cannot be loaded using the deck skid.

DGS is vertically loaded. Computer, Output and Input/Control Modules, RAD, packaged cables and spares are loaded individually.

	Man-hours (approximate)
Load/Install	8
Check-out	20
Unload	1

INSTALLATION

Computer, Output, and Input/Control Modules are coupled together and moved into position on torpedo rack. For the SSN 594 class, the modules are loacted on the port side, inboard, upper level, center stowage position. For the 637 class the modules are located on the starboard side, upper level, inboard stowage position. Modules are clamped in place. RAD is placed in the Attack Center facing the Attack Console and is used as a seat locker.

All connections are made with carry-on cables.

Calibration, alignment, and transmission checks are made before operation.

Baseline: Torpedo Mk 48 BIP ORDALT.

MODIFIED DATA GATHERING SYSTEM

for Fire Control Systems
Mk 112/2 Mk 113/6,8
Mk 113/9,10 (SSN 686,687) Mk 113/12,14

. . . and Weapon Systems
Mk 37 Mk 48 HARPOON

DIMENSIONS (IN)

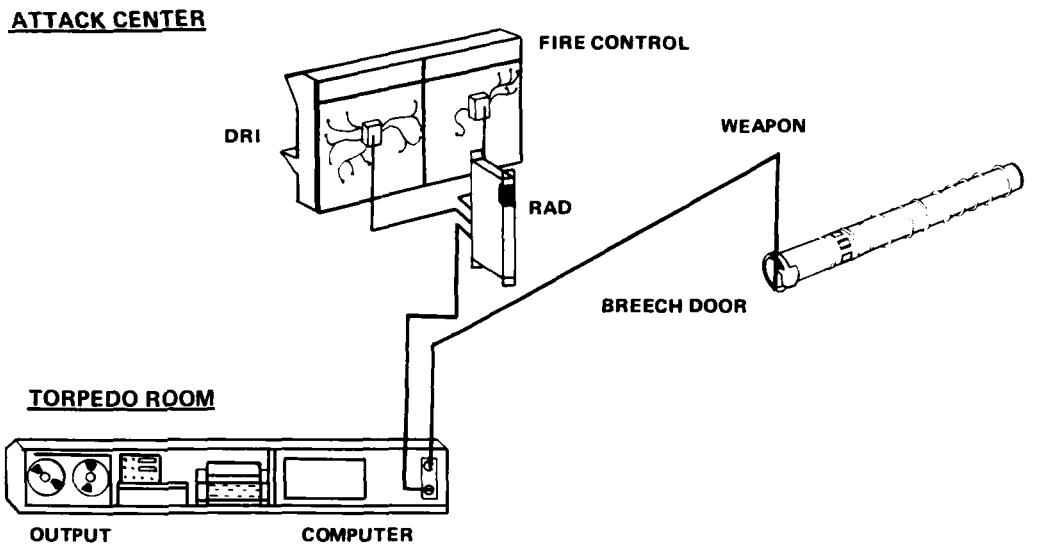
	w	h	d
COMPUTER MODULE	67	22	24
OUTPUT MODULE	67	22	24
RAD	23	9	55

WEIGHTS (LB)

COMPUTER MODULE	485
OUTPUT MODULE	502
RAD	204

POWER REQUIREMENTS

	Vac	Hz	Ø	VA
TORPEDO ROOM	115	400	3	1000
TORPEDO ROOM	115	60	1	1000
ATTACK CENTER	115	400	3	800



MDGS MODULES

SPECIFICATIONS

Timing. clock, microwave or pulse.
Output: mag tape, line printer, punch tape.
Capacity: 193 data channels, 192 discrete bits.
Recording Rates: 0.1- and 1.0-second intervals, or manual/external marks.

DATA ACCESS

Attack Center data are accessed by the T-connector, cable assemblies, and junction boxes of the DRI.

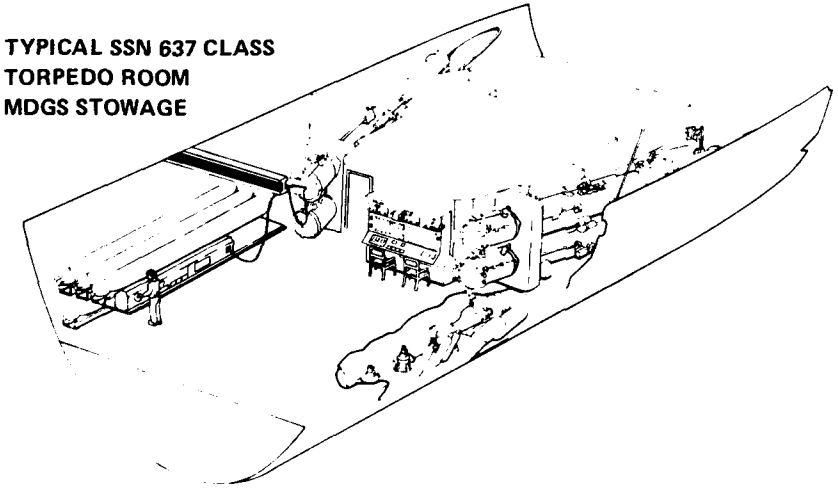
Weapon data are accessed through a T-connector and cable assembly connected together at the breech door.

SHIPBOARD DATA RECORDED

FCS MK	FCS MOD	SHIPBOARD SOURCE	DATA: OWN SHIP	BEARING/RANGE	TARGET MOTION ANAL.	WEAPON ORDER ANAL.	POSITION KEEPING	DEAD RECKONING	FIRING SEQUENCE	WIRE COMMANDS	WIRE CURRENT	PRESETS	WEAPON ORDER	WEAPON STATUS	TUBE STATUS
112	2	ATTACK CONSOLE	●	●	●	●	●	●					●	●	●
		TORPEDO CONTROL CONSOLE MK 66				●				●	●	●			●
		BREECH DOOR				●			●			●			
113	6, 8	ANALYZER MK 51 (1)		●	●										
		STABILIZATION CONTROL UNIT MK 83 (1)(3)			●										
		ATTACK DIRECTOR MK 75	●	●	●	●	●	●					●	●	
		TORPEDO CONTROL CONSOLE MK 66				●	●			●	●	●			
	9, 10 (3)	ATTACK CONTROL CONSOLE MK 50 (1)(2)	●	●										●	●
	12, 14	BREECH DOOR				●			●			●			
		DIGITAL INTERCONNECT BOX (2)		●	●										
		FIRING CONSOLE MK 85 (3)												●	●

(1) FCS MK 113/6, 8, 12, 14 ONLY (2) FCS MK 113/9 ONLY (3) SSN 686,687

TYPICAL SSN 637 CLASS
TORPEDO ROOM
MDGS STOWAGE



PREPARATION FOR LOADING

MDGS is uncrated at dockside after rail, truck, or air shipment and loaded by crane. All handling gear is provided with MDGS. Loading requires ship's force, topside supervisor, and tagline handlers. NUSC supplies trained personnel to supervise loading of equipment and conduct installation and operation. Computer and Output Modules may be loaded individually or coupled together. Vertical or skid mounting is operational, as determined by submarine class. The RAD, packaged cables, and spares are loaded immediately following Computer and Output Modules.

	Man-hours (approximate)
Load/Install	8
Check-out	20
Unload	1

INSTALLATION

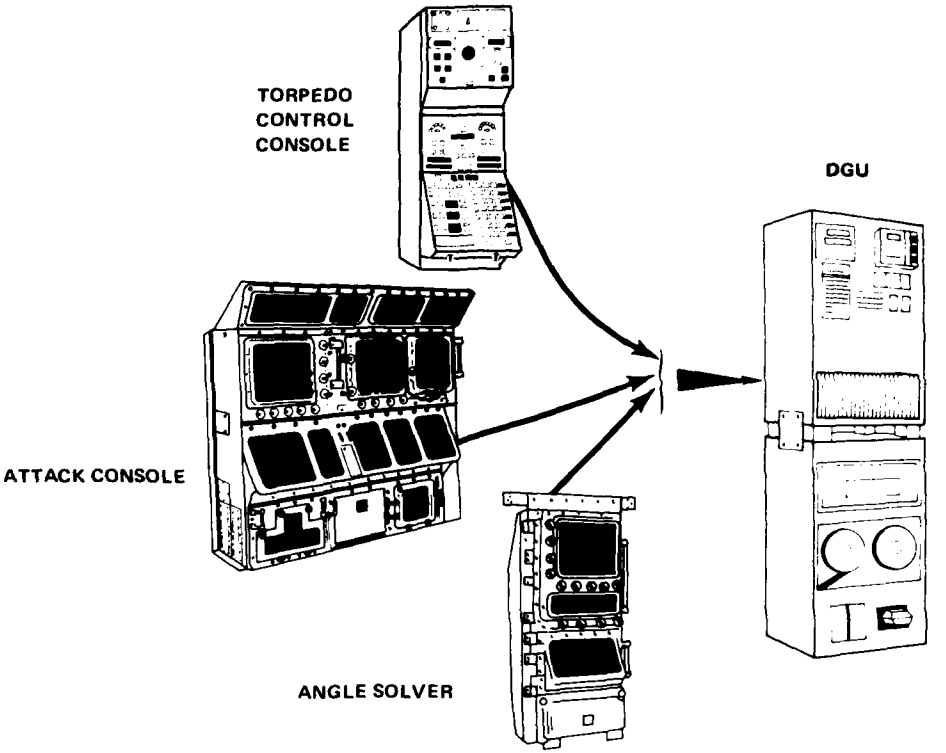
Computer and Output Modules are moved into position on the torpedo rack. For the SSN 594 class, the modules are located on the starboard side, inboard, upper level, center stowage position. For the 637, 608, 616 and 640 classes, the modules are located on the port side, upper level, inboard stowage position. Modules are clamped in place. RAD is placed in the Attack Center in the alleyway behind the fire control system. All connections are made with carry-on cables. Calibration, alignment, and transmission checks are made before operation.

Baselines: Torpedo Mk 48 BIP ORDALT, FCS Mk 112/2 (SHIPALT SSBN-1128, rev. 1), FCS 113/9 (SHIPALT SSBN-1123, rev. 3).

DATA GATHERING UNIT

for Fire Control Systems Mk 101/(all) Mk 106/(all) Mk 112/2

. . . and Weapon System Mk 48



DIMENSIONS (IN)

	w	h	d
COMPUTER MODULE	21	28	15
CONVERTER MODULE	21	28	15

WEIGHTS (LB)

COMPUTER MODULE	170
CONVERTER MODULE	170

POWER REQUIREMENTS

	Vac	Hz	Ø	VA
ATTACK CENTER	115	400	3	400
ATTACK CENTER	115	60	1	700

SPECIFICATIONS

Timing: clock, microwave, or pulse.
Output: mag tape, line printer, punch tape.
Capacity: 35 data channels, 48 discrete bits.
Recording Rates: 0.1- and 1.0-second intervals or manual mark.

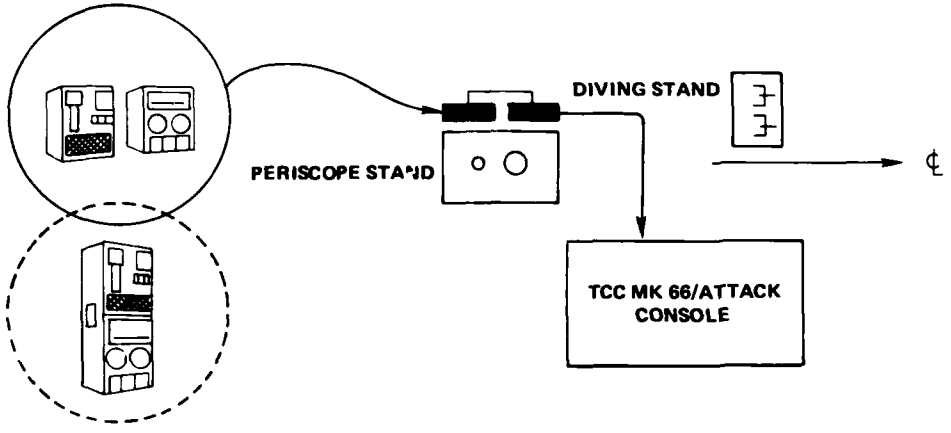
DATA ACCESS

Attack Center data are accessed by the T-connector, cable assemblies, and junction boxes of the DRI.

SHIPBOARD DATA RECORDED

FCS MK	FCS MOD	SHIPBOARD SOURCE	DATA: OWN SHIP	BEARING/RANGE	TARGET MOTION ANAL	WEAPON ORDER GEN.	POSITION KEEPING	DEAD RECKONING	FIRING SEQUENCE	WIRE COMMANDS	WIRE CURRENT	PRESETS	WEAPON ORDER	WEAPON STATUS	TUBE STATUS
101	ALL	ANGLE SOLVER MK 18	●	●	●	●	●	●	●	●	●	●		●	●
		TORPEDO CONTROL CONSOLE MK 66				●				●	●	●	●		
106	ALL	ANGLE SOLVER MK 18	●	●	●	●	●	●	●					●	●
		TORPEDO CONTROL CONSOLE MK 66				●				●	●	●	●		
112	2	ATTACK CONSOLE MK 39	●	●	●	●	●	●	●					●	●
		TORPEDO CONTROL CONSOLE MK 66				●				●	●	●	●		

TYPICAL INSTALLATION



PREPARATION FOR LOADING

The DGU is uncrated at dockside after rail, truck, or air shipment and loaded by crane. All handling gear is provided with DGU. Loading requires ship's force, topside supervisor, and tagline handlers. NUSC supplies trained personnel to supervise loading of equipment and conduct installation and operation. The DGU is hatch-loaded. Computer and Converter Modules and packaged cables and spares are loaded individually.

	Man-hours (approximate)
Load/Install	6
Check-out	20
Unload	1

INSTALLATION

The DGU is placed side-by-side or stacked in the Attack Center or Crew's Mess and lashed in place. Interconnecting cable lengths limit locating the DGU to within 25 feet of the FCS.

All connections are made with carry-on cables.

Calibration, alignment, and transmission checks are made before operation.

Baselines: Torpedo Mk 48 BIP ORDALT, FCS Mk 112/2 (SHIPALT SSBN-1128, rev. 1), FCS 101 and 106 (ORDALT 8875 and SHIPALT SSN-1977).

MODIFIED DATA GATHERING UNIT

for Fire Control Systems Mk 101/(all) Mk 106/(all) Mk 112/2 Mk 113/6, 8, 10 (SSN 686, 687) Mk 113/12, 14

. . . and Weapon System Mk 48

DIMENSIONS (IN)

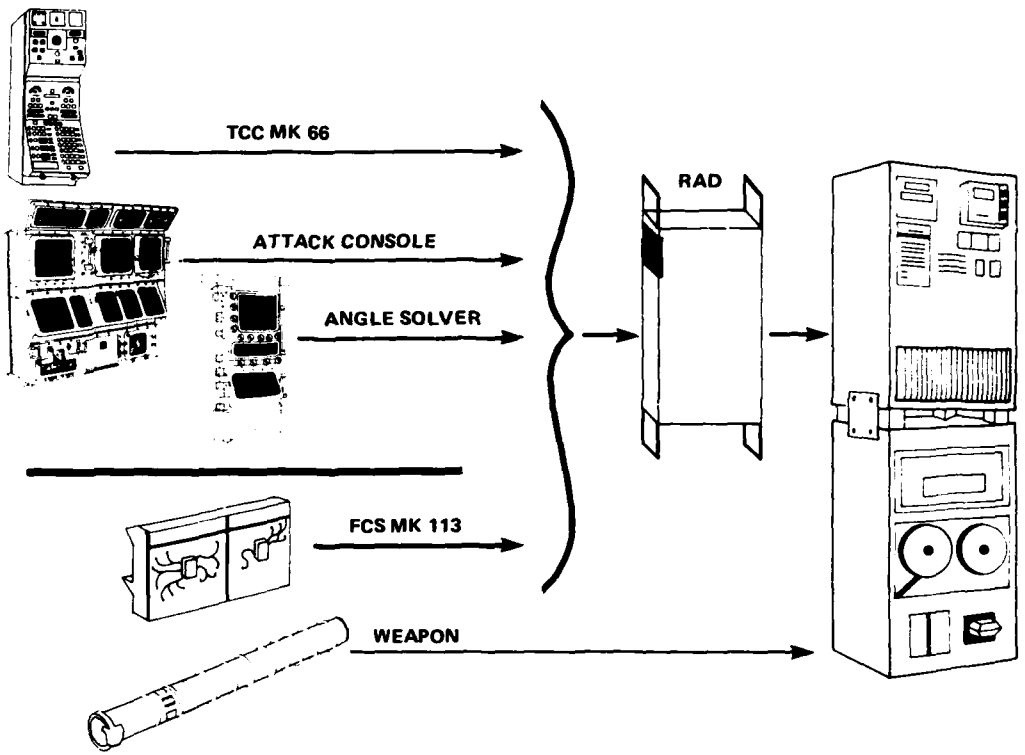
	w	h	d
COMPUTER MODULE	20	28	16
CONTROL MODULE	20	28	16
RAD	10	23	41

WEIGHTS (LB)

COMPUTER MODULE	170
CONTROL MODULE	170
RAD	203

POWER REQUIREMENTS

	Vac	Hz	Ø	VA
ATTACK CENTER	115	400	3	400
ATTACK CENTER	115	60	1	700
TORPEDO ROOM	115	60	1	700



SPECIFICATIONS

Timing: clock, microwave or pulse.
Output: mag tape, line printer, punch tape.
Capacity: 102 data channels, 74 discrete bits.
Recording Rates: 0.1- and 1.0-second intervals or manual mark.

DATA ACCESS

Attack Center data are accessed by the T-connector, cable assemblies, and junction boxes of the DRI.

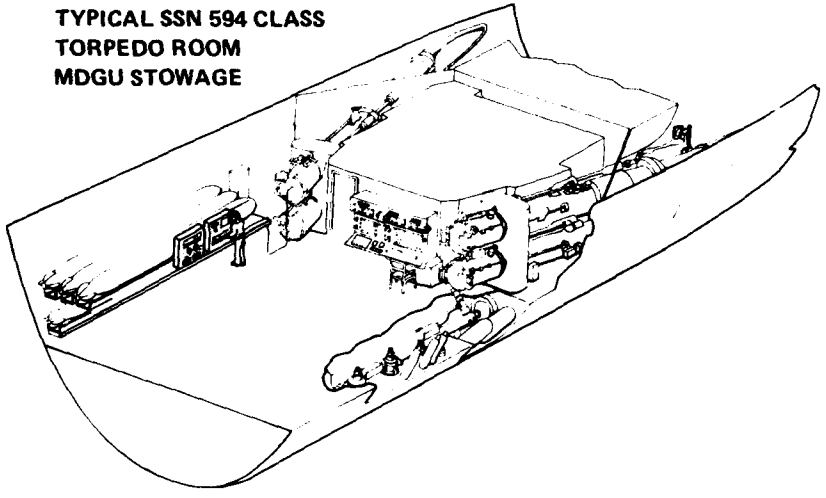
Weapon data are accessed through a T-connector and cable assembly connected together at the breech door.

SHIPBOARD DATA RECORDED

FCS MK	FCS MOD	SHIPBOARD SOURCE	OWN SHIP	BEARING/RANGE	TARGET MOTION ANAL.	WEAPON ORDER ANAL.	POSITION KEEPING	DEAD RECKONING	FIRING SEQUENCE	WIRE COMMANDS	WIRE CURRENT	PRESETS	WEAPON ORDER	WEAPON STATUS	TUBE STATUS
			DATA												
101	ALL	ANGLE SOLVER MK 18	●	●	●	●	●						●		
		TORPEDO CONTROL CONSOLE MK 66				●				●	●	●			
106	ALL	ANGLE SOLVER CONTROL MK 18	●	●	●	●	●						●		
		TORPDEO CONTROL CONSOLE MK 66				●				●	●	●			
112	2	ATTACK CONSOLE MK 39	●	●	●	●	●						●		
		TORPEDO CONTROL CONSOLE MK 66				●				●	●	●			
113	6, 8	ATTACK DIRECTOR MK 75	●	●	●	●	●	●					●		
	10[1]	ATTACK CONTROL CONSOLE MK 50												●	●
	12, 14	TORPEDO CONTROL CONSOLE MK 66				●				●	●				
		BREECH DOOR							●			●			
		FIRING CONSOLE MK 85[1]												●	●

(1) SSN 686, 687

TYPICAL SSN 594 CLASS TORPEDO ROOM MDGU STOWAGE



PREPARATION FOR LOADING

The MDGU is uncrated at dockside after rail, truck, or air shipment and loaded by crane. All handling gear is provided with MDGU. Loading requires ship's force, topside supervisor, and tagline handlers. NUSC supplies trained personnel to supervise loading of equipment and conduct installation and operation.

The MDGU is hatch-loaded. Computer and Control Modules and RAD and packaged cables and spares are loaded individually.

	Man-hours (approximate)
Load/Install	6
Check-out	20
Unload	1

INSTALLATION

Modules are placed side-by-side or stacked in the Attack Center or the Torpedo Room and lashed in place. Interconnecting cable lengths limit locating the RAD to within 25 feet of the FCS Mk 101, 106, 112, and to within 8 feet of the DRI of the FCS Mk 113. Computer and Control Modules must be within 200 feet of the RAD.

All connections are made with carry-on cables.

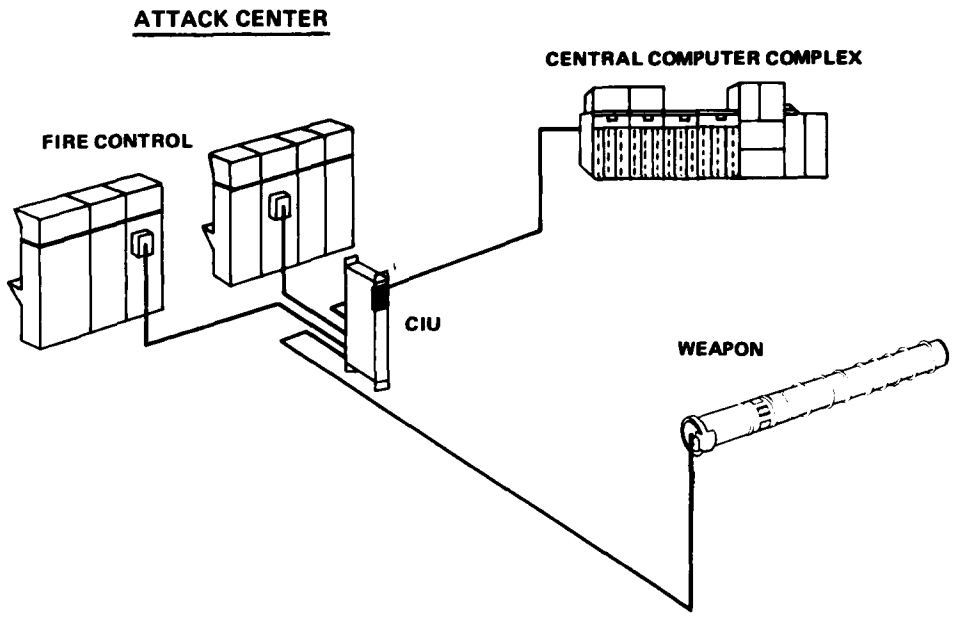
Calibration, alignment, and transmission checks are made before operation.

Baselines: Torpedo Mk 48 BIP ORDALT, FCS Mk 112/2 (SHIPALT SSN-1128, rev. 1), FCS 101 and 106 (ORDALT 8875 and SHIPALT SSN-1977).

CONVERTER INTERFACE UNIT

for Fire Control System
Mk 113/10 (SSN 688 CLASS)

. . . and Weapon System
Mk 48



DIMENSIONS (IN)

	w	h	d
CONVERTER INTERFACE UNIT	55	23	9

WEIGHT (LB)

CONVERTER INTERFACE UNIT	204

POWER REQUIREMENTS

	Vac	Hz	Ø	VA
CONVERTER INTERFACE UNIT	115	400	3	800

SPECIFICATIONS

Timing: real-time clock.
Output: mag tape, line printer, punch tape.
Capacity: 197 channels, 192 discrete bits.
Recording Rates: 0.1-, 1.0-, and 10-second intervals.

DATA ACCESS

Attack Center data are accessed by the T-connector, cable assemblies, and junction boxes of the DRI.

Weapon data are accessed through a T-connector and cable assembly connected together at the breech door.

CIU transmits Attack Center and weapon data to the Central Computer Complex.

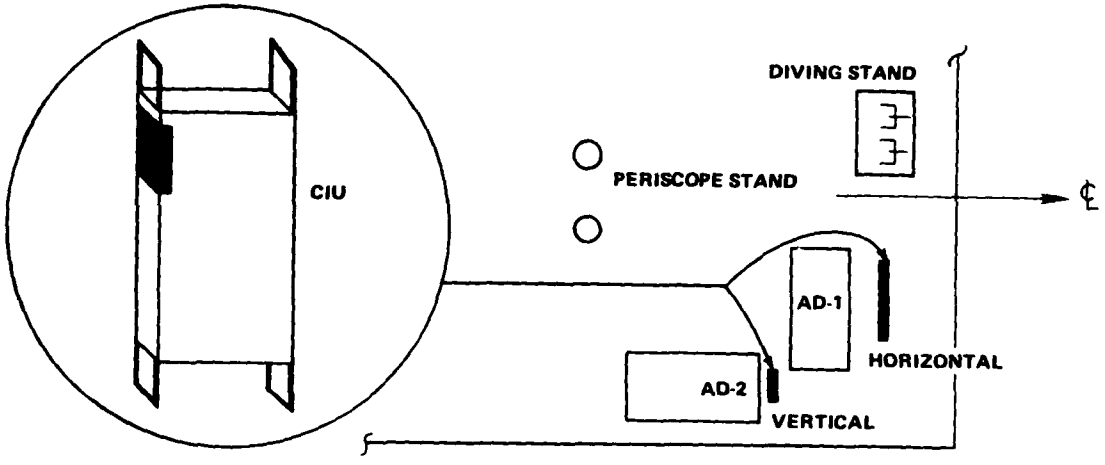
SHIPBOARD DATA RECORDED

FCS MK	FCS MOD	SHIPBOARD SOURCE	DATA: OWN SHIP	BEARING/RANGE	TARGET MOTION ANAL.	WEAPON ORDER ANAL.	POSITION KEEPING	DEAD RECKONING	FIRING SEQUENCE	WIRE COMMANDS	WIRE CURRENT	PRESETS	WEAPON ORDER	WEAPON STATUS	TUBE STATUS
113	10[1]	ATTACK DIRECTOR MK 75		●	●	●	●	●							●
		TORPEDO CONTROL CONSOLE MK 66				●					●		●		
		BREECH DOOR							●			●	●		
		FCS CORE RESIDENT	●				●	●		●		●		●	
		AN/BQQ 5		●	●										
		FIRING CONSOLE MK 85												●	●

(1) SSN 688 CLASS

The data gathering/recording functions for the SSN 688 class are integral to the Central Computer Complex. A software program referred to as FDG controls the data recorded.

In addition to recording the Attack Center and weapon data from the CIU, the FDG program records other FCS Mk 113/10 variables and AN/BQQ-5 data.



PREPARATION FOR LOADING

The CIU is uncrated at dockside after rail, truck, or air shipment and loaded by crane. All handling gear is provided with CIU. Loading requires ship's force, topside supervisor, and tagline handlers. NUSC supplies trained personnel to supervise loading of equipment and conduct installation and operation.

The CIU is hatch-loaded onboard and hand-carried to the Attack Center. Packaged cables and spares are loaded individually.

	Man-hours (approximate)
Load/Install	8
Check-out	10
Unload	1

INSTALLATION

The CIU is stowed in the Attack Center behind Attack Director-1, or alongside Attack Director-2, and lashed down using carrying handles as fasteners.

All connections are made with carry-on cables.

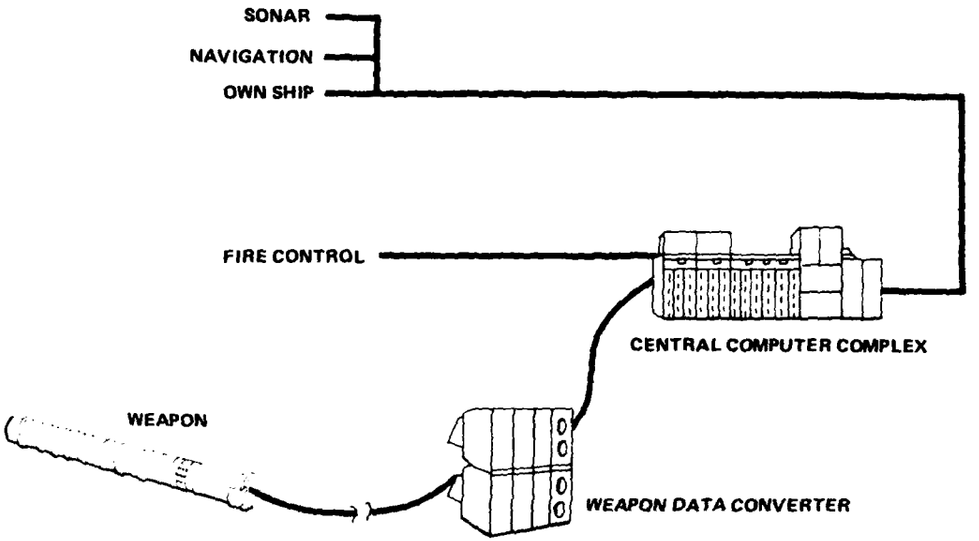
CIU calibration, alignment, and transmission checks are made before operation. The operator at the OJ-287 Input/Output Console activates the FDG Program.

Baselines: SSN 688 class FCS Mk 113/10, ORDALT 8279.

DATA GATHERING MODULE

for Fire Control Systems
Mk 117/1, 2, 3 Mk 117/0
(Mk 48 and HARPOON only)

. . . and Weapon Systems
Mk 48, Mk 37, HARPOON



DIMENSIONS (IN)

NOT APPLICABLE. DGM IS A SOFTWARE PACKAGE INTEGRAL TO THE FCS MK 117 COMPUTER PROGRAM.

WEIGHTS (LB)

NOT APPLICABLE

POWER REQUIREMENTS

NOT APPLICABLE

SPECIFICATIONS

Timing: real-time clock.
Output: mag tape, line printer, punch tape.
Capacity: 195 words
Recording Rates: 0.1-, 1.0-, and 10-second intervals.

DATA ACCESS

Weapon data are accessed by the carry-on-board T-connector cable assemblies connected together at the breech door.

Weapon data are transmitted to Weapon Data Converter Mk 82.

SHIPBOARD DATA RECORDED

FCS MK	FCS MOD	SHIPBOARD SOURCE	DATA: OWN SHIP	BEARING/RANGE	TARGET MOTION ANAL	WEAPON ORDER GEN.	POSITION KEEPING	DEAD RECKONING	FIRING SEQUENCE	WIRE COMMANDS	WIRE CURRENT	PRESETS	WEAPON ORDER	WEAPON STATUS	TUBE STATUS
117		WEAPON DATA CONVERTER MK 82											●	●	
		FCS MK 117 CORE RESIDENT	●			●	●	●		●	●				●
		AN/BQQ-5		●	●										
		BREECH DOOR							●			●			

The data gathering/recording functions for the FCS Mk 117 are integral to the Central Computer Complex. Data recorded are controlled by a software program referred to as FDG.

In addition to the weapon data from the Weapon Data Converter Mk 82, the FDG records other FCS Mk 117 variables and AN/BQQ-5 data.

PREPARATION FOR LOADING

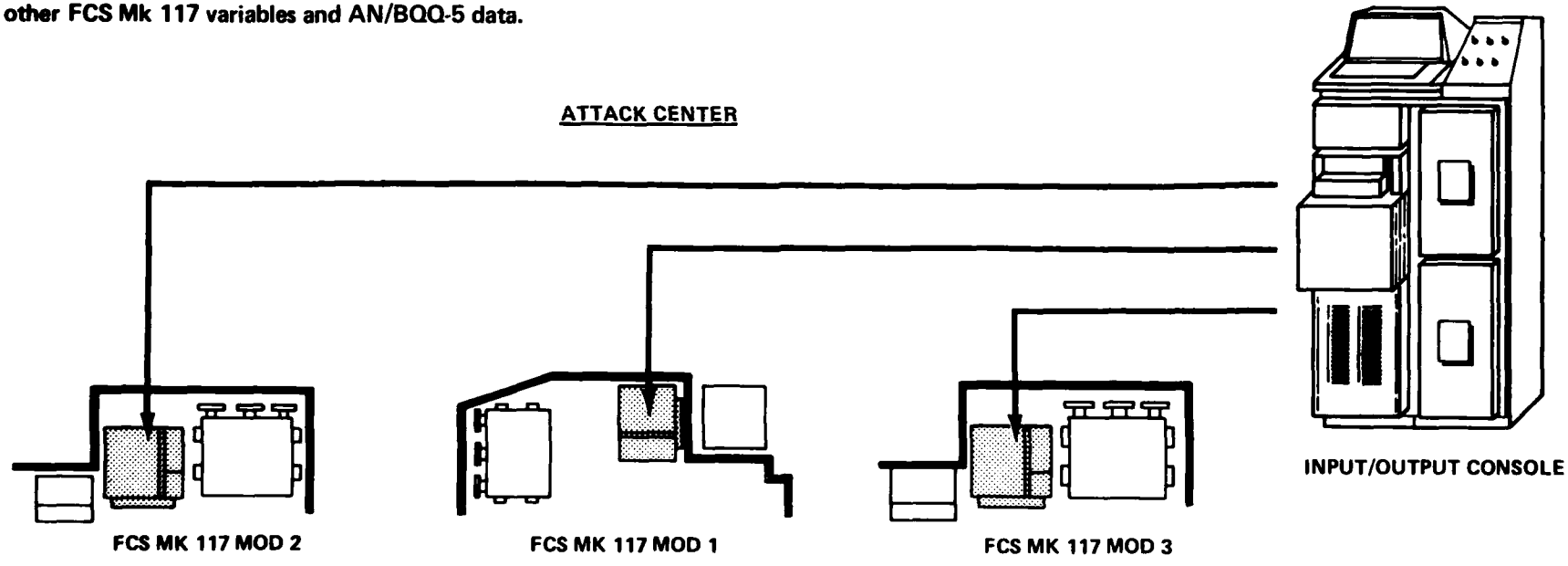
None. A single cable is hand-carried onboard ship.

INSTALLATION

DGM uses existing shipboard equipment.

All connections are made with carry-on cables.

The operator activates the FDG Program at the OJ-172 console (Mods 1, 2, 3) or at the OJ-287 console (Mod 0).

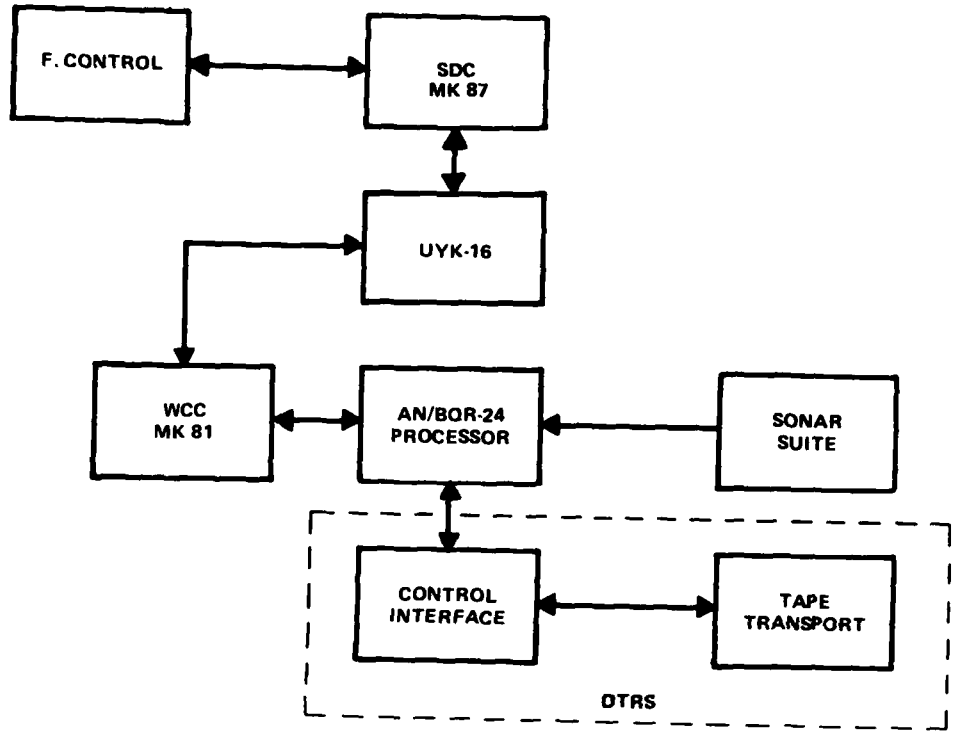


DIGITAL TAPE RECORDER SUBSYSTEM

for Fire Control Systems Mk 113/12,14

. . . Weapon Systems Mk 48

. . . and Sonar System AN/BQR-24



DIMENSIONS (IN)

	w	h	d
TAPE CONTROL INTERFACE BOX	21	9	27
TAPE TRANSPORT	21	26	15
CABLE STORAGE DRUM	(1)	17	–

(1) DIAMETER 22 INCHES

WEIGHTS (LB)

TAPE CONTROL INTERFACE BOX	40
TAPE TRANSPORT	90
CABLE STORAGE DRUM	20

POWER REQUIREMENTS

	Vac	Hz	ø	A
INPUT	115	60	1	5

SPECIFICATIONS

Output: mag tape.
Capcity: 72 data channels, 46 discrete bits.
Recording Rates: 1.0-, and 10-second intervals.

DATA ACCESS

Attack Center and sonar data are accessed through a connector on the AN/BQR-24 Signal Data Processor.

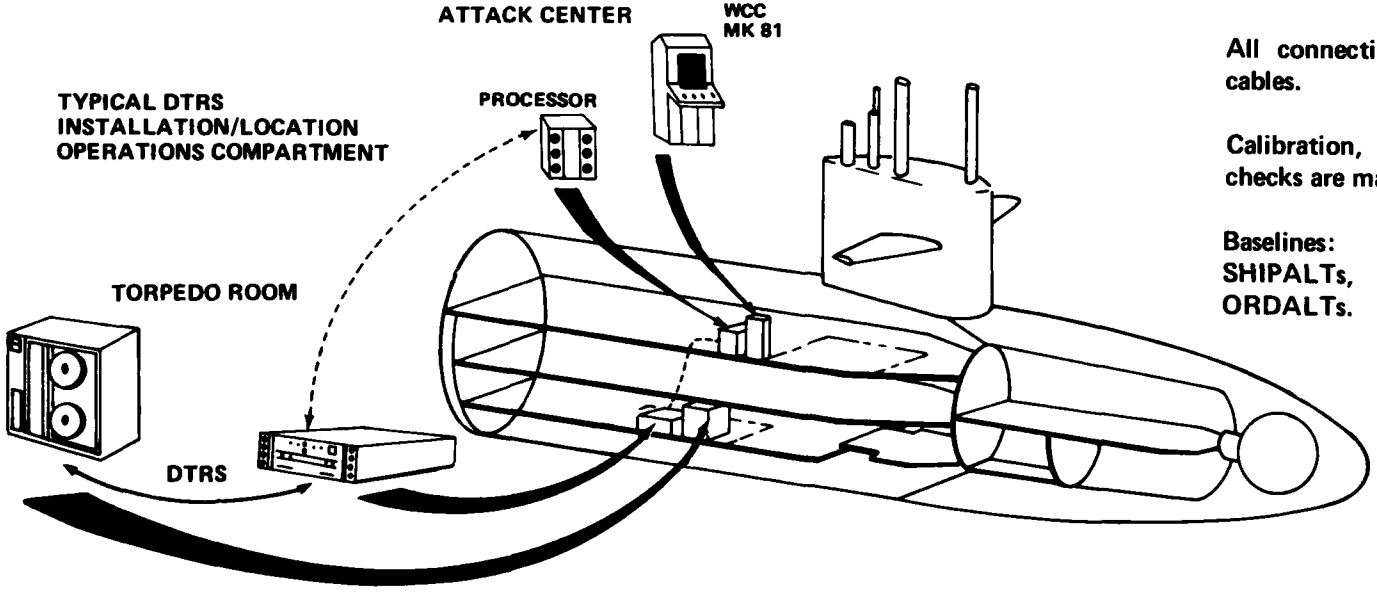
DTRS provides 2-way data transfer between the AN/BQR-24 and mag tape recorder.

SHIPBOARD DATA RECORDED

FCS		SHIPBOARD SOURCE	DATA												
			OWN SHIP	BEARING/RANGE	TARGET MOTION ANAL	WEAPON ORDER GEN.	POSITION KEEPING	DEAD RECKONING	FIRING SEQUENCE	WIRE COMMANDS	WIRE CURRENT	PRESETS	WEAPON ORDER	WEAPON STATUS	TUBE STATUS
MK	MOD														
113	12, 14	SIGNAL DATA CONVERTER MK 87				●				●	●	●			
		AN/BQR-24	●	●			●								●

DTRS records the AN/BQR-24 sonar system and FCS Mk 113 Mods 12 and 14 data for recall and use by the operator.

DTRS records and plays back TATE/TELCOM information and can be used as a backup to record Attack Center data.



PREPARATION FOR LOADING

Components are housed in carrying case for two-man carry. All handling gear is provided with DTRS. Loading requires ship's force. NUSC supplies trained personnel to supervise loading of equipment and conduct installation and operation.

The DTRS is hatch-loaded and hand-carried to the Torpedo Room. Packaged cables and spares are loaded individually.

INSTALLATION

Carry-on cables connect Signal Data Processor AN/BQR-24 to the Tape Control Interface Box and the Tape Control Interface Box to the Tape Transport.

All connections are made with carry-on cables.

Calibration, alignment, and transmission checks are made before operation.

Baselines: MPS Sonar ORDALTs and SHIPALTs, Mk 48 TATE/TELCOM ORDALTs.

TORPEDO TUBE INSTRUMENTATION SYSTEM

for Torpedo Tubes
Mk 51, 52, 54, 56, 58, 59, 63, 64, 65, 67, 68
(Use with Mk 68 requires modification of TTIS)

. . . Torpedoes Mk 48 Mk 37

. . . and Targets Mk 27 Mk 30

DIMENSIONS (IN)

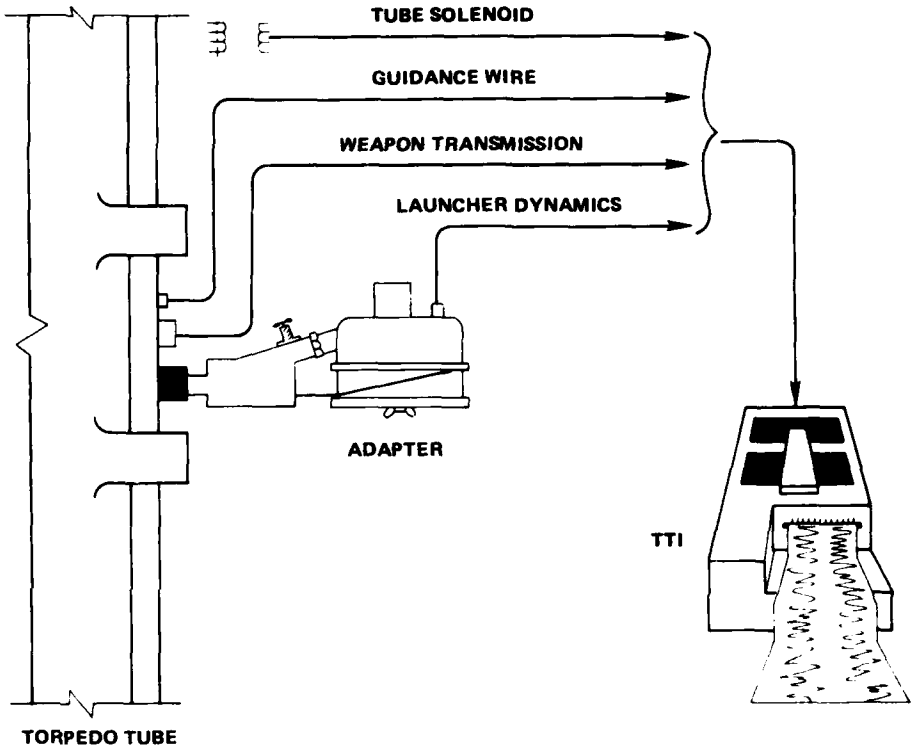
		w	h	d
RECORDER		13	11	14
ACCESSORY (2)	EACH	13	13	24

WEIGHTS (LB)

RECORDER (1)		60
ACCESSORY (2)	EACH	70

POWER REQUIREMENTS

	Vac	Hz	ø	VA
RECORDER	115	60	1	



SPECIFICATIONS

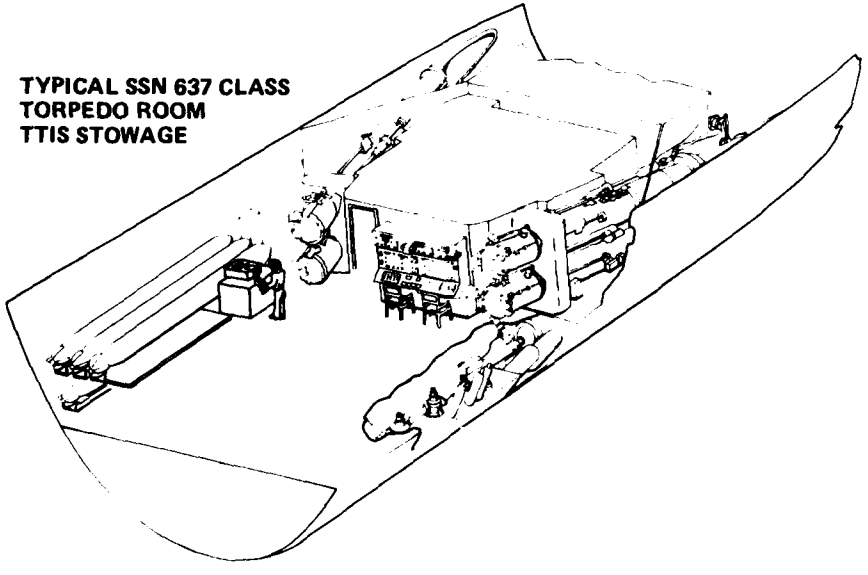
Timing: Annotated 100-ms line trace.
Output: Oscillograph chart.
Capacity: 14 data channels.
Frequency response: 60 to 500 Hz.

DATA ACCESS

Weapon transmissions are accessed by a T-connector (B-B Adapter) attached to the Mk 42 Breech Door Connector. Tube solenoid operation is accessed by a pickup coil. Tube pressure, torpedo exit velocity, and displacement are accessed at the sight glass through a SUBSAFE adapter. Wire continuity and commands are accessed by a wire adapter plug at the breech door.

SHIPBOARD DATA RECORDED

SOURCE		DATA													
TTIS	SHIPBOARD	CONTINUITY VDC	TONES	FIRE	IMPULSE RETURN	MAIN MOTOR START	MK 48 MONITOR/IDENT	TORPEDO SERVICE POWER	TORPEDO TUBE ΔP	TORPEDO EXIT VELOCITY	A-CABLE SEVER	TORPEDO DISPLACEMENT	TUBE FIRE SOLENOID	ZERO REFERENCE
WIRE ADAPTER PLUG	BREECH DOOR	●	●											
B-B CONNECTOR	B-CABLE			●	●	●	●	●						
TRANSDUCER	TUBE SIGHT CLASS								●					
TACHOMETER	(PV PISTOL)									●				
115 Vac, 60 Hz	(PV PISTOL)										●			
CAM SWITCH	(PV PISTOL)											●		
PICKUP	TUBE SOLENOID												●	
CALIBRATION														●



TYPICAL SSN 637 CLASS TORPEDO ROOM TTIS STOWAGE

PREPARATION FOR LOADING

NUSC supplies trained personnel who load, install and operate.

The TTIS is hatch-loaded. The oscillograph recorder and two auxiliary cases are hand-carried to the Torpedo Room. Packaged cables and spares are loaded individually.

INSTALLATION

On SSBN class submarines, the oscillograph recorder is placed on the starboard work-bench, forward of the stowage tracks. On attack-class submarines, it is placed atop the portside locker.

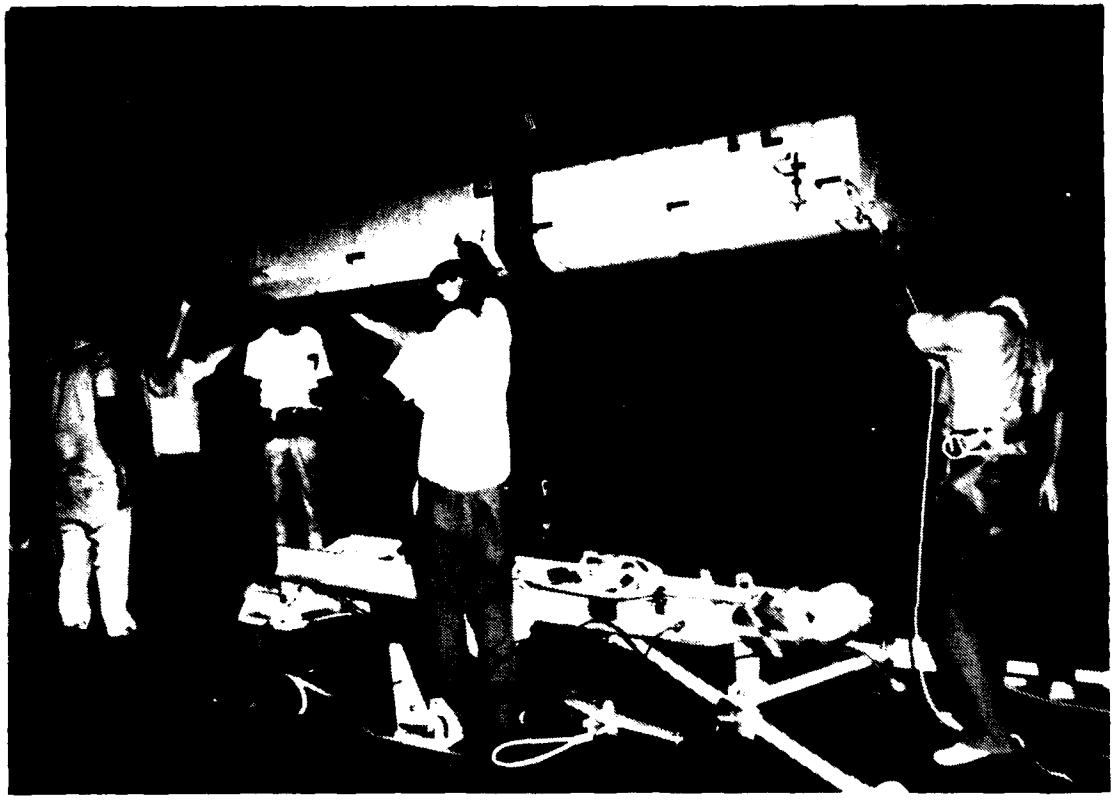
All connections are made with carry-on cables. Guidance wire, weapon transmission, and launch-dynamics interface connections are made at the breech door. The tube solenoid pickup coil is connected directly to the solenoid.

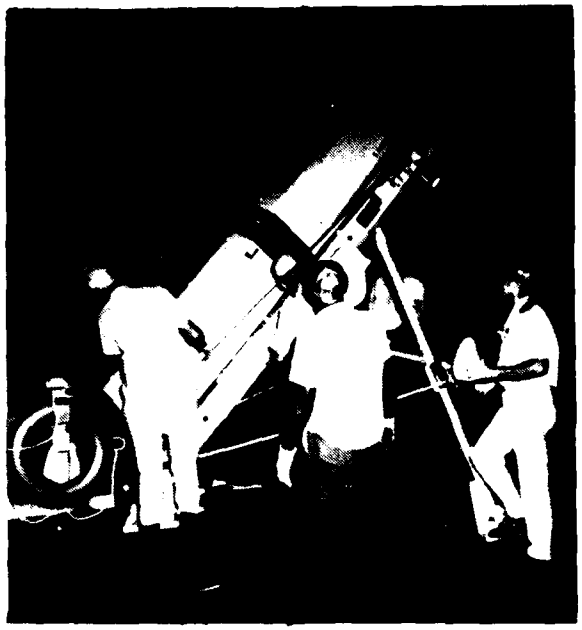
Pre-installation check and alignments are made before operation.

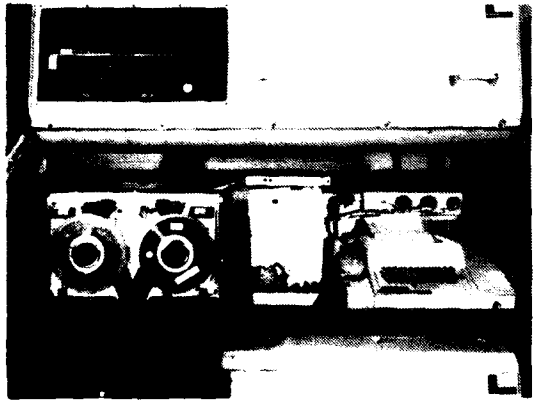
Baselines: Basic Mk 48 Program ORDALTs and SHIPALTs.

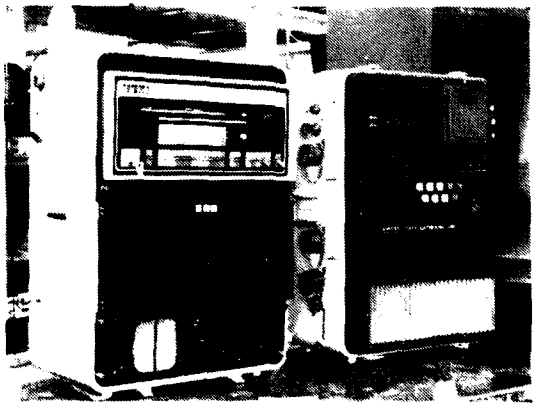
LIST OF ACRONYMS

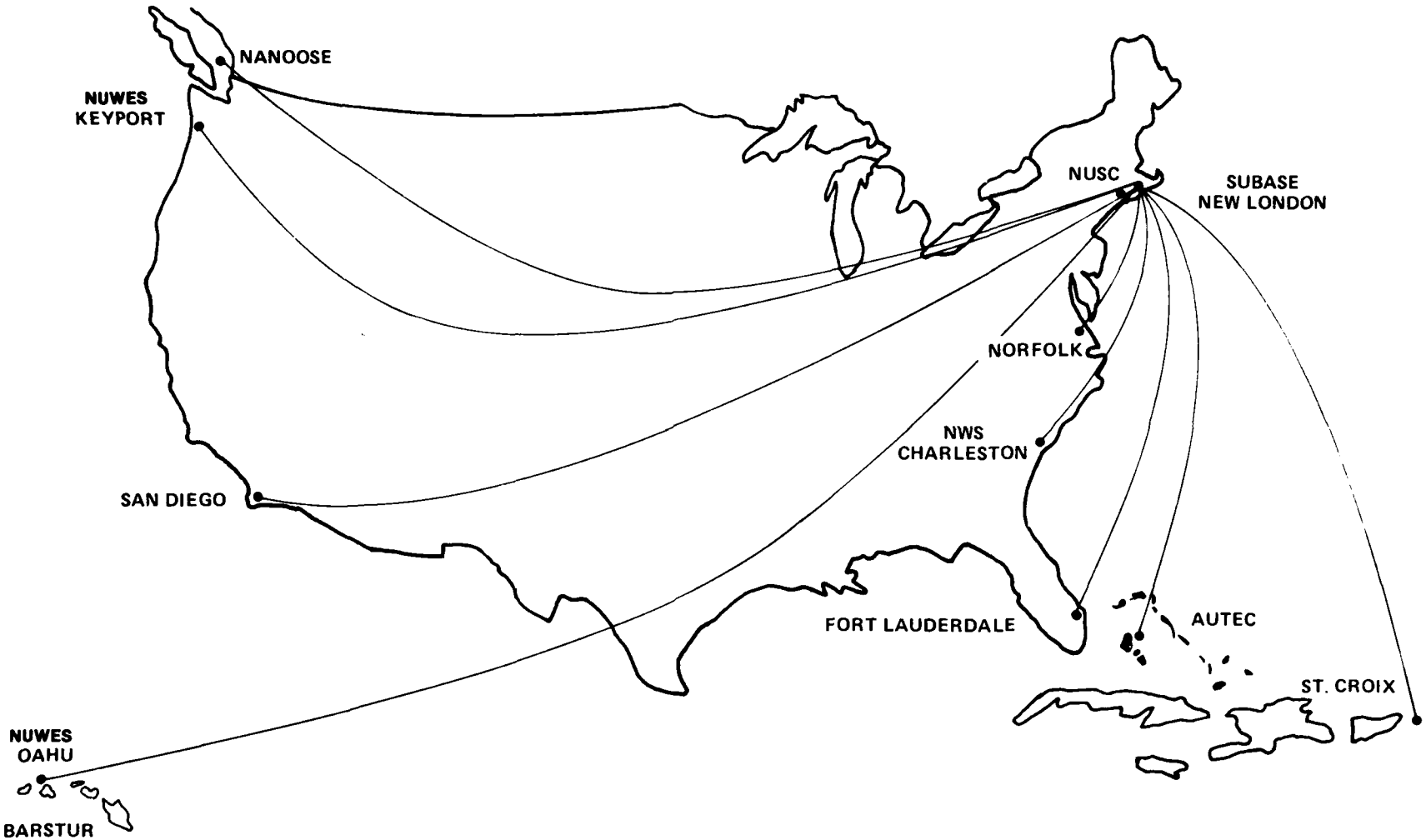
ASW	Antisubmarine Warfare
AUTEC	Atlantic Undersea Test and Evaluation Center
BARSTUR	Barking Sands Tracking Underwater Range
BIP	Ballistic Improvement Program
CCT	Combined Certification Test
CIU	Converter Interface Unit
CSCT	Combined Systems Certification Trials
DGM	Data Gathering Module
DGS	Data Gathering System
DGU	Data Gathering Unit
ΔP	Differential Pressure
DRI	Data Recording Interface
DTRS	Digital Tape Recorder Subsystem
FCS	Fire Control System
FDG	Data Gathering Recording Subprogram
FORACS	Fleet Operational Readiness Accuracy Check Site
IMA	Intermediate Maintenance Activity
MDGS	Modified Data Gathering System
MDGU	Modified Data Gathering Unit
MRC	Maintenance Requirement Card
NAVSEA	Naval Sea Systems Command
NSB	Naval Submarine Base
NUSC	Naval Underwater Systems Center
NUWES	Naval Undersea Warfare Engineering Station
NWS	Naval Weapon Station
ORDALT	Ordnance Alteration
PCO	Prospective Commanding Officer
PMS	Program Manager at NAVSEA
PRO	Proficiency
RAD	Remote Analog/Digital Converter
SDRI	Shipboard Data Recording Instrumentation
SHIPALT	Ship Alteration
SUBASE	Submarine Base
SUBLANT	Submarine Force, Atlantic Fleet
SUBPAC	Submarine Force, Pacific Fleet
TATE	Torpedo Attack Evaluator
TCP	Training and Certification Program
TELCOM	Telemetry Communications
TMA	Target Motion Analysis
TTIS	Torpedo Tube Instrumentation System
WSAT	Weapon System Accuracy Trials










NANOOSE
NUWES
KEYPORT
NUSC
SUBASE
NEW LONDON
NORFOLK
NWS
CHARLESTON
SAN DIEGO
FORT LAUDERDALE
AUTEC
ST. CROIX
NUWES
OAHU
BARSTUR

NUSC Technical Document 5660
Reviewed and Approved: 26 April 1979

J.E. Sirmalis
Head, Weapon Systems Department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